(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization International Bureau



(43) International Publication Date 24 June 2004 (24.06.2004)

PCT

(10) International Publication Number WO 2004/053414 A1

(51) International Patent Classification7: F28D 1/047, B21D 53/08

F28F 1/32,

(74) Agents: HIBI, Norihiko et al.; c/o KISHIMOTO & CO., 3rd Floor, Inaba Building, 13-18, Nishishinsaibashi

(21) International Application Number:

PCT/JP2003/015701

(22) International Filing Date: 9 December 2003 (09.12.2003)

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:

2002-357466

10 December 2002 (10.12.2002) JP

- 60/440,373 16 January 2003 (16.01.2003)
- (71) Applicant (for all designated States except US): SHOWA DENKO K.K. [JP/JP]; 13-9, Shiba Daimon 1-chome, Minato-ku, Tokyo 105-8518 (JP).
- (72) Inventor; and
- (75) Inventor/Applicant (for US only): WATANABE, Isao [JP/JP]; c/o SHOWA DENKO K.K., OYAMA RE-GIONAL OFFICE, 480, Inuzuka 1-chome, Oyama-shi, Tochigi 323-8678 (JP).

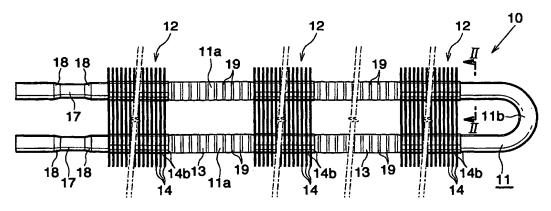
- 1-chome, Chuo-ku, Osaka-shi, Osaka 542-0086 (JP).
- (81) Designated States (national): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.
- (84) Designated States (regional): ARIPO patent (BW, GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

with international search report

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: FINNED TUBE FOR HEAT EXCHANGERS, HEAT EXCHANGER, APPARATUS FOR FABRICATING HEAT EX-CHANGER FINNED TUBE AND PROCESS FOR FABRICATING HEAT EXCHANGER FINNED TUBE



(57) Abstract: A plurality of fin groups 12 each comprising parallel plate fins 14 are arranged on two straight tube portions 11a of a fin fixing hairpin tube 11 longitudinally of the tube portions at a spacing, by forming two tube inserting holes 14a as spaced apart in each of the plate fins 14 and inserting the two straight tube portions 11a through the respective holes 14a of the plate fins 14. The hairpin tube 11 is enlarged with use of a fluid to fixedly fit the plate fins 14 of the fin groups 12 around the straight tube portions 11a of the tube 11. The straight tube portions 11a of the tube 11 each have a finless part 13 provided between each pair of adjacent fin groups 12. The finless part 13 of each straight tube portion 11a bears clamp marks 19 on the outer peripheral surface thereof. A heat exchanger comprising a heat exchanger finned tube 10 thus constructed is adapted to diminish leakage of the refrigerant and achieves a desired refrigeration efficiency.



INTERNATIONALSEARCHREPORT

International application No.

PCT/JP03/ 15701

A. CLASSIFICATIONOF SUBJECT MATTER F28F1/32, F28D1/047, B21D53/08			
According to International Patent Classification (IPC) or to both national classification and IPC			
B. FIELDS SEARCHED			
Minimum documentation searched (classification system followed by classification symbols) Int.Cl7 F28F1/32,F28D1/047,B21D53/08			
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched Japanese Utility Model Gazette 1926-1996, Japanese Publication of Unexamined Utility Model Applications 1971-2004, Japanese Registered Utility Model Gazette 1994-2004, Japanese Gazette Containing the Utility Model 1996-2004			
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)			
C. DOCUMENTS CONSIDERED TO BE RELEVANT			
Category*	Citation of document, with indication, where ap	propriate, of the relevant passages	Relevant to claim No.
A	JP 4-279234 A (SHOWA ALUMI 1992.10.05 (Family:None)	NUM CORPORATION)	1-22
A	JP 9-253775 A (SHOWA ALUMINUM CORPORATION) 1997.09.30 (Family:None)		1-22
A	A JP 2002-282972 A(SHOWA DENKO K.K.)2002.10.02(Family:None)		1-22
			·
Further documents are listed in the continuation of Box C. See patent family annex.			
* Special categories of cited documents: "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier application or patent but published on or after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone			the application but cited to inderlying the invention cannot considered to involve an
is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "O" document referring to an oral disclosure, use, exhibition or other means "O" document referring to an oral disclosure, use, exhibition or other combined with one or more other such documents, such documents, such documents or more other such documents.			step when the document is r such documents, such on skilled in the art
"P" document published prior to the international filing date but later "&" document member of the same patent family than the priority date claimed			
Date of the actual completion of the international search 10.03.2004		23. 3. 2004	
Name and mailing address of the ISA/JP		Authorized officer	3M 8610
Japan Patent Office		YOICHI NAGASAKI	
3-4-3, Kasumigaseki, Chiyoda-ku, Tokyo 100-8915, Japan Tele		Telephone No. +81-3-3581-1101 E	xt. 3377